EASTERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION

AGRICULTURAL RESEARCH SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

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United States Department of Agriculture
Agricultural Research Service
Washington 25, D.C.

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EASTERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION

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Dairy Products Laboratory

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Milk Properties Laboratory

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Meat Laboratory

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R. K. ESKEW
Engineering & Development Laboratory

T. L. McMEEKIN
Pioneering Laboratory for Animal Proteins

H. STEVENS*
Pioneering Laboratory for Agricultural Allergens

* *Located at Washington, D.C.*

** *Located at Beltsville, Md.*

October 1960

UTILIZATION RESEARCH IN USDA

These are days of unprecedented abundance in American agriculture. A few crops are in serious surplus, and many others are produced in record quantities. Utilization research is a vigorous, coordinated effort by the U.S. Department of Agriculture to discover new and wider uses for farm products.

The work is conducted in four Utilization Research and Development Divisions, which are outgrowths of the four USDA regional research laboratories established by Congress in 1938 to increase the outlets for farm commodities, especially those in surplus.

While primarily serving agriculture, utilization research benefits industry, labor, and consumers - the Nation as a whole.

HOW UTILIZATION RESEARCH IS ADMINISTERED

The utilization research program is headed by a deputy administrator of USDA's Agricultural Research Service. It is carried out in four Utilization Research and Development Divisions -- Eastern (Wyndmoor, Pa.), Northern (Peoria, Ill.), Southern (New Orleans, La.), and Western (Albany, Calif.).

Most of the scientific work is done in the headquarters and field stations of these Divisions. Some is also performed under contract with various research institutions. Recently, laboratories abroad have received utilization research grants, with payments to be made in the country's own currency in return for American farm commodities.

In common with other USDA research programs, utilization research is reviewed annually by some 25 commodity and functional advisory committees. These committees help to guide and coordinate the Department's research effort and ensure that a close liaison is maintained with agricultural experiment stations and industrial institutions engaged in related work.

This administrative framework is designed to focus the utilization research effort on the most important and promising areas, without hampering the initiative of the individual scientist.

The headquarters of the Eastern Utilization Research and Development Division, in Wyndmoor, Pa. (near Philadelphia).

UTILIZATION RESEARCH AT THE EASTERN DIVISION

Each of the four Utilization Research and Development Divisions has responsibility for the development of new uses for certain specified agricultural commodities of national significance. Some of these commodities are produced throughout the country, such as dairy products, animal fats, and meat, for which the Eastern Division is responsible. Others are primarily produced in the geographical region served by the particular Division. Thus the Eastern

Division, serving the 14-State area from Maine to Kentucky, carries out research on such regional crops as tobacco, Eastern deciduous fruits and vegetables, and maple.

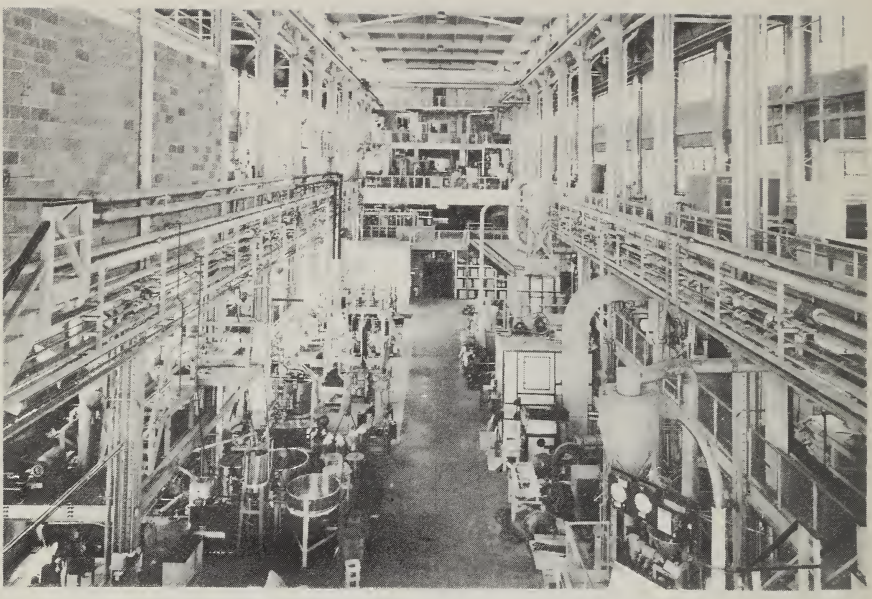
On the commodities for which it is responsible, the Eastern Utilization Research and Development Division conducts a comprehensive program of fundamental and applied research in chemistry, the physical sciences, the biological sciences, and engineering.

The Division consists of 10 laboratories. Seven of these -- concerned with animal fat products, animal fat properties, animal proteins, milk properties, engineering and development, hides and leather, and plant products -- are located in the headquarters building in the Philadelphia suburb of Wyndmoor, Pa. The other 3 lab-

oratories -- those concerned with allergens, dairy products, and meat -- are located in Washington, D.C., and Beltsville, Md. Their exact locations are given on pages 34-35.

The staff of the Eastern Division numbers about 400, a majority of whom are scientists and technicians. The rest provide administrative management, stenographic and clerical services, operation and maintenance of buildings, and mechanical services. All positions are within the Civil Service.

Fields of research in the Eastern Division.

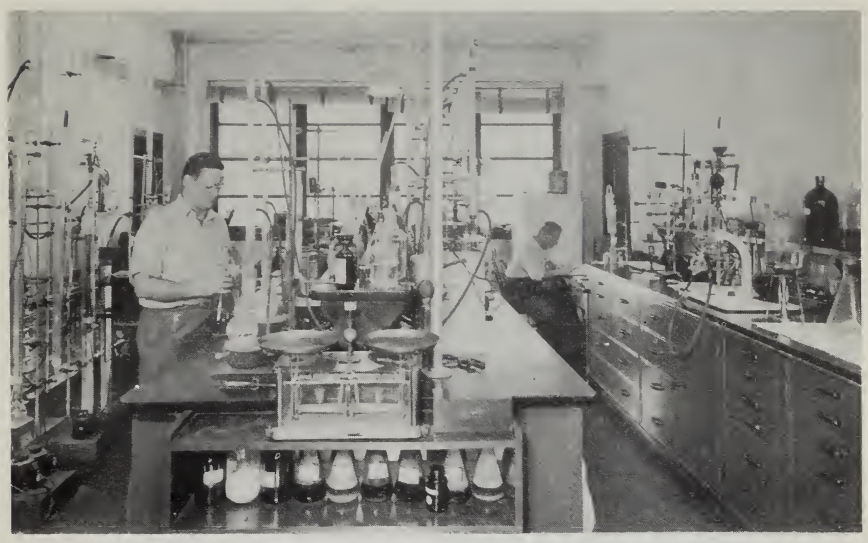


Pilot plant of the Eastern Division, Wyndmoor, Pa.

PHYSICAL FACILITIES

The U-shaped, three-story building at Wyndmoor, which is headquarters for the Eastern Division, houses a series of interconnected laboratory rooms with small adjoining offices for study and writing, a basement-to-roof pilot plant that occupies almost one full wing of the building, administrative offices, library, auditorium, conference rooms, shops, and cafeteria. Large-scale solvent extractions and high-pressure experiments and large-scale drying operations are performed in smaller buildings elsewhere on the grounds.

All of the laboratories of the Eastern Division -- at Wyndmoor as well as at Washington and Beltsville -- are equipped with up-



Typical laboratory room in the Eastern Division headquarters, Wyndmoor.

to-date research equipment such as ultracentrifuges, electrophoresis apparatus, and spectrophotometers of various kinds. The Dairy Products Laboratory also contains complete equipment for processing dried milk, cheese, and other products on a pilot-plant scale.

Taste panel at work in food preparation and evaluation laboratory, Wyndmoor.

The laboratory for allergens research provides facilities for clinical studies, as well as basic chemical and bioassay work. The Meat Laboratory is equipped for the processing, analyzing, and taste-testing of meat, and has access to complete slaughtering facilities.

Preparation of samples for evaluation at Eastern Division's Meat Laboratory, Beltsville, Md.

Library at Wyndmoor contains 15,000 volumes and receives 500 scientific and technical periodicals.

THE LABORATORIES

The Eastern Utilization Research and Development Division consists of 7 Laboratories for research on specific commodities and groups of commodities, 1 for engineering and development, and 2 for pioneering research. The commodity Laboratories are doing both fundamental and applied research to widen outlets in their assigned areas through the development of new or improved products and processes. The Engineering and Development Laboratory is responsible for engineering research and pilot-plant development in all commodity areas. The Pioneering Research Laboratories, where fundamental research is conducted on animal proteins and on agricultural allergens, are carrying on work for which the U.S. Department of Agriculture has been well known for many years. These Laboratories are numbered among several small research groups within the Agricultural Research Service which are chartered to conduct basic investigations in their field without the restrictions ordinarily imposed by narrowly defined projects.

The following is a brief account of the work being done in each of these Laboratories. This, along with the next section which enumerates some of the outstanding accomplishments of the Division, will indicate the direction of the work and the kinds of results to be expected.

ANIMAL FAT PRODUCTS LABORATORY

Inedible animal fats have posed a serious utilization problem ever since synthetic detergents began to replace soap. Rising consumption of meat has further aggravated the situation by increasing the tonnages of these fats to be disposed of. A steady demand for animal fats abroad has prevented an actual accumulation of surpluses, but domestic markets that will be both more reliable and more profitable are urgently needed.

The research approach to wider utilization involves the development of a host of new products through chemical modification of animal fats. In this Laboratory lubricants and lubricant additives, water repellents, and plasticizers have been prepared from fat derivatives. Synthetic detergents have been made from animal fats, too, by the sulfonation of fatty acids and by other processes. Purified oleic acid has been made from animal fats, and the chemists have also derived several potentially useful compounds from wool grease.

ANIMAL FAT PROPERTIES LABORATORY

Basic to the development of new products from animal fats -- or any other new raw material, for that matter -- is a full understanding of fundamental properties. In this Laboratory the most advanced methods and facilities are used to determine the chemical composition and structure of edible as well as inedible animal fats. Their physical structure is also explored by such techniques as

Structure of plastics made from animal fats determined by recording x-ray diffraction unit.

spectrophotometry, X-ray diffraction, and electron microscopy. Through these studies the characteristics and behavior of both the raw material and the final product are thoroughly established.

DAIRY PRODUCTS LABORATORY

In view of seasonal dairy surpluses, utilization research on milk and milk products forms a large and important part of the Eastern Division's program. Research on concentrated and dried milk, cheese, and butter aims at improving quality and lowering costs through better methods of processing, handling, and preserving. Scientists are trying to identify the specific flavor components of milk as a means of retaining flavor and preventing the development of off-flavors in the processing of milk and milk products. In other research, cheesemaking procedures are being mechanized, failures in bacterial starter cultures are being overcome, and profitable uses for byproduct whey are being sought.

Research is improving the keeping properties of butter and butter oil, and demonstrating the value of a wider use of nonfat dry milk, such as in baking.

Also under investigation are methods that might be used to treat milk in the event of its contamination by radioactive fallout.

Now under development in the Eastern Utilization Research and Development Division is a new method of drying whole milk. In cooperation with the Engineering and Development Laboratory, which is working out pilot-plant processes for making dry whole milk (see pages 18-19), the Dairy Products Laboratory is doing research on the chemistry and storage properties of the new product.

MILK PROPERTIES LABORATORY

To support dairy-products research, many basic studies of milk -- a fantastically complex substance -- are needed. Physical chemists are using ultracentrifugal, electrophoretic, light-scattering, and radioactive-tracer techniques to determine the molecular-kinetic properties of milk proteins in solution and to measure the forces acting between the proteins and other molecules. Meanwhile, biochemists are studying milk enzymes, the effect of heat on milk proteins, and interactions among the various components of milk. This basic physical-chemical and biochemical research is being used to improve processing techniques -- for example, to make concentrated milks better able to resist fat separation and gelation on storage.

HIDES AND LEATHER LABORATORY

A sharp decline in the demand for leather has emphasized the need for more economical and better leathers to meet the com-

petition of plastics and other substitutes. The research of this Laboratory is seeking to hold and expand the markets that leather still commands, and to open up new large-scale outlets for leather, for example, in the garment field.

Leather is tanned with dialdehyde starch in experimental tanning drum.

New tanning processes utilizing dialdehyde starch and glutaraldehyde are being studied as means of imparting new properties to leather. A rapid method of unhairing hides by use of enzymes, now under development, may introduce new economy and efficiency in leather production.

Balancing these practical investigations, and providing background information for them, is a fundamental study of the physical structure and basic chemical components of hides and leather.

MEAT LABORATORY

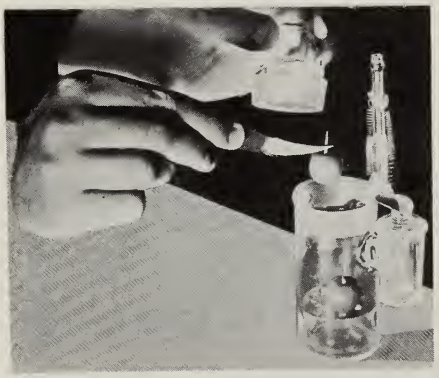
Research in this Laboratory is designed to improve methods of handling, preserving, and processing meats. Better quality in meat and meat products is being sought through chemical, biological, and technological investigations. These include studies of meat proteins and the chemical reactions they undergo during processing, oxidation of the fatty tissues of frozen meat in relation to rancidity, bacteria as producers of flavor in cured hams, the effect of microorganisms on the stability of fat in meat products,

and juiciness of meat as a function of water-holding capacity. The fundamental research being undertaken here has an important bearing on practical problems in meat processing and distribution, such as the preservation of quality in cured and freezer-stored meats.

Protein being analyzed in Meat Laboratory with the aid of electrophoresis equipment.

PLANT PRODUCTS LABORATORY

A wide variety of products is being studied in this Laboratory, including Eastern fruits and vegetables, honey, maple, tobacco, and uncultivated plants. Much of the research is on the basic chemistry of these materials -- for example, studies of the chemical composition and physical structure of fruits and vegetables, which are designed to show how the flavor, appearance, and nutritional value of fresh foods can better be preserved in processing.

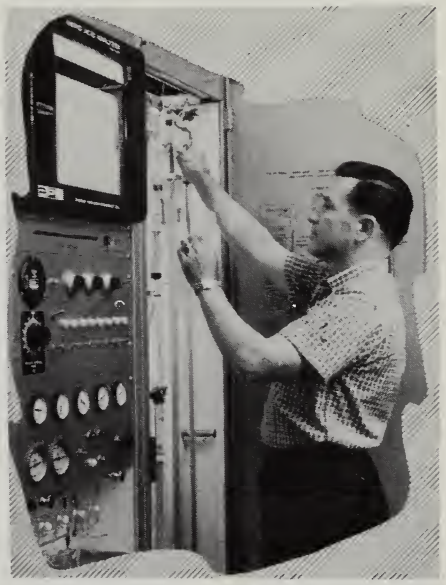


This device measures respiration, and its use on cherries has established a relationship between bruising and the surface discoloration (scald) that cherries sometimes develop during processing.

Research is finding new uses for honey -- for example, as an ingredient of pharmaceutical preparations and baked goods. Other work is revitalizing the maple-sirup industry, devising new equipment and methods to increase the income farmers can make from their maple trees.

The composition of tobacco and its smoke is being determined as a means of improving quality and uncovering industrial uses for tobacco byproducts.

Thousands of uncultivated plants, shipped from all over the world, are screened for steroids and other complex compounds of potential value in making cortisone, hormones, and other drugs. Domestic cultivation of the more promising of these plants may be attempted by the Crops Research Division of the Agricultural Research Service.



Automatic analyzer is used to separate and identify the amino acids of potatoes and green vegetables.

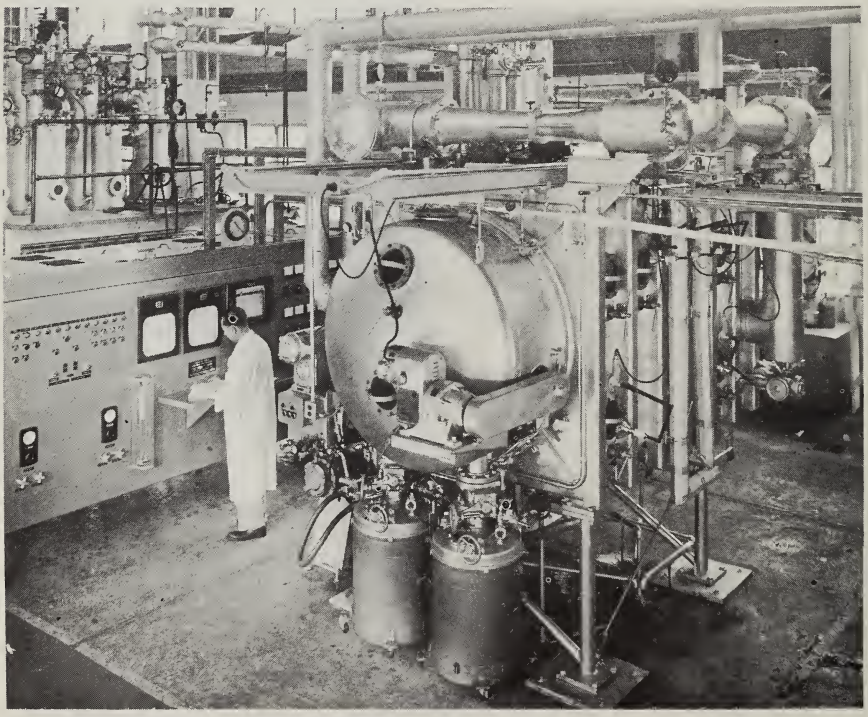
ENGINEERING AND DEVELOPMENT LABORATORY

A product or process originating in small-scale research usually requires a great deal of further development before it is

ready for commercialization. Will it work on a larger scale? How much will it cost? What equipment will be needed? Of what material should the equipment be made?

The responsibility of the Engineering and Development Laboratory is to find answers to such questions. The Laboratory's pilot plant provides facilities for performing experimental operations on a larger-than-laboratory scale. When standard apparatus is not available, the engineers of this Laboratory design specialized equipment.

The Engineering and Development Laboratory does original research and provides engineering consultant services for the



Continuous vacuum dehydrator for pilot-plant production of dry whole milk.

other Laboratories of the Eastern Division. Among its original achievements are processes to make potato flakes and to recover the aroma of fruit juices. Experimental processes of the other Laboratories are also tried out here on a pilot-plant scale, and samples are produced for commercial evaluation.

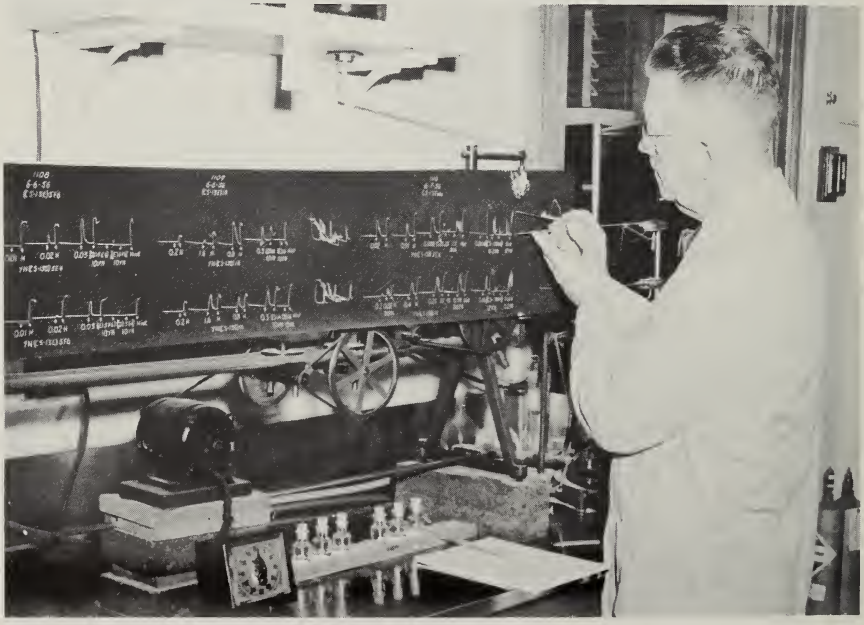
Dry whole milk, which is being studied in the Dairy Products Laboratory (see page 14), is made by a process now being developed in the Engineering and Development Laboratory. This milk powder, first produced on a small scale by a batch process, disperses instantly in cold water and makes a drink virtually indistinguishable from fresh milk. A pilot plant for drying whole milk by a continuous process, using the same engineering principles, is now in experimental operation.

PIONEERING RESEARCH LABORATORY FOR ANIMAL PROTEINS

The Pioneering Research Laboratory for Animal Proteins is famous for its research on the proteins of milk. Scientists of this Laboratory have shown that the caseins, albumins, and globulins that make up these proteins are not pure substances, but complex mixtures of similar fractions of slightly differing properties. As these fractions are separated, isolated, and identified by painstaking research, fundamental information is being obtained that may have profound effects on the future science and technology of milk and milk products.

PIONEERING RESEARCH LABORATORY FOR ALLERGENS IN AGRICULTURAL PRODUCTS

The Pioneering Research Laboratory for Allergens in Agricultural Products also has behind it a long history of research on a subject important for the utilization of farm commodities. Such products as castor beans, cottonseed, and milk contain substances called allergens which can cause severe reactions in people who are allergic to them. This is a limitation to a wider use of such commodities. Scientists of this Laboratory are making fundamental chemical and immunological studies in an effort to isolate, identify, and if possible, eliminate specific allergens. This work is revealing the physiological nature and mechanisms of allergic sensitivity and its relation to the chemical structure of allergens.



The reaction of sensitized animal muscle tissue to an allergen is recorded on the smoked screen of a kymograph.

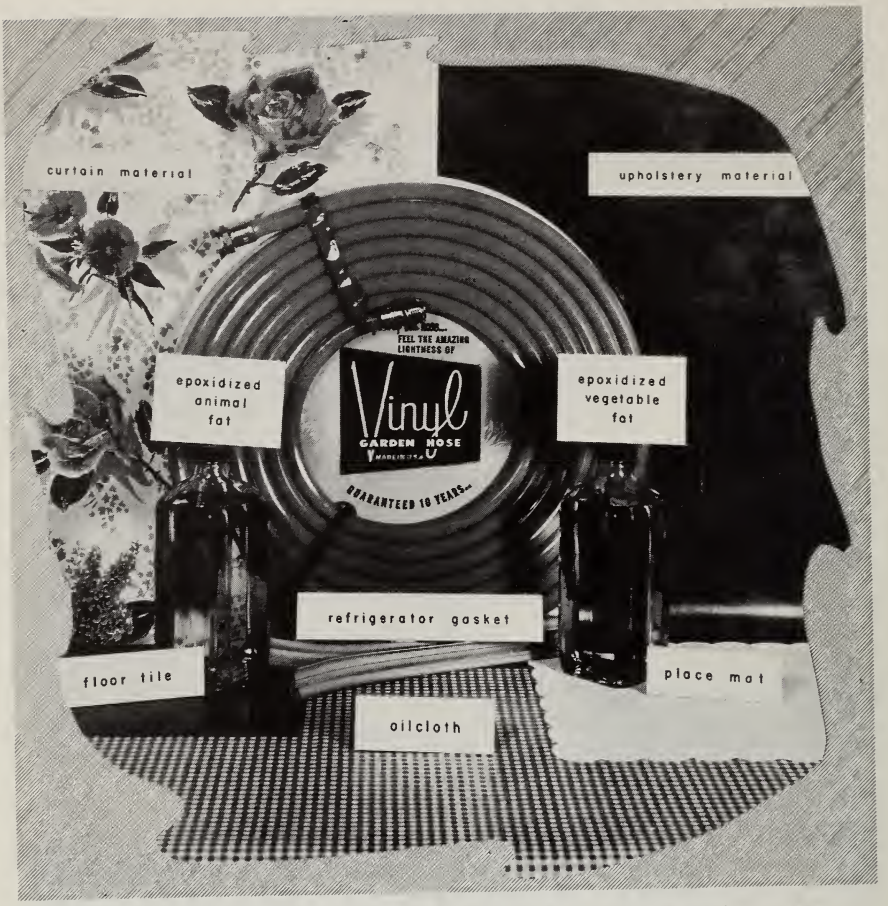
ACCOMPLISHMENTS

As we have seen, the Laboratories of the Eastern Utilization Research and Development Division are diverse, and the commodities worked on are largely unrelated except for their agricultural origin. Thus the accomplishments vary widely, as the following examples will show, and range from the invention of a new method for dehydrating mashed potatoes to the discovery of a new protein in milk.

FATS IN PLASTICS

Synthetic detergents and plastics have become household words in the past two decades as a result of chemical research. The first displaced soap as the principal outlet for inedible animal fats. The second, thanks to the efforts of Eastern Division scientists, now provides a market for at least some of these displaced fats. Research has shown that animal fats can be made into excellent plasticizers -- known as epoxides -- which impart remarkable resistance to deterioration by heat and light. Since their introduction a few years ago, their commercial production has increased to about 30 million pounds a year.



Some plastic items made with fat-derived epoxidized compounds as plasticizers.

Another newly-developed animal-fat derivative, called vinyl stearate, can be used to make a permanently flexible plastic. This is done by chemically combining vinyl stearate with vinyl acetate. This copolymer can be made more flexible by increasing the amount of vinyl stearate used. Furthermore, its flexibility remains because the vinyl stearate, which acts as the plasticizer,

is chemically bound within the plastic and cannot leach out as do conventional plasticizers which are simply mixed mechanically with the base material.

POTATO FLAKES

Today's supermarket shelves contain several brands of a phenomenally successful dehydrated mashed-potato product called potato flakes. Potato flakes were developed by Eastern Division

Experimental manufacture of potato flakes in the Eastern Division's pilot plant, Wyndmoor.

engineers who conceived the idea that potatoes could be dried so rapidly on the surface of a revolving drum that flavor would be preserved.

This completely novel approach to mashed-potato dehydration was an almost immediate success. By the third year of commercial production, 11 plants were in operation, with a potential output of nearly 50 million pounds of potato flakes a year, valued at 30 million dollars. In an average 200-day operating season, these plants can use 7 million bushels of potatoes.

Flake plants are located in most of the principal potato-growing States, including Maine, New York, Michigan, Minnesota, North Dakota, Idaho, and Oregon. Most potato varieties produced throughout the country are suitable for making excellent dehydrated mashed potatoes by the flake process.

Consumers have enthusiastically received potato flakes, since they combine the convenience of a processed food with the wholesome flavor of a freshly prepared dish. Americans prefer their potatoes mashed, but have not been serving as many in recent years because of the time and labor required to prepare them. Thus the development of potato flakes should do much to reverse the trend toward lower consumption of potatoes and to provide a steady market for growers' surpluses.

TREATMENT FOR DAIRY WASTES

Bottle washings and other wastes from dairies must be treated before disposal, to prevent stream pollution. Until a few years

ago, the only waste-treatment systems available were elaborate and expensive. Many small dairies were threatened with extinction because they could not afford such installations to meet the clean-stream legislation being passed by most States and municipalities.

Eastern Division microbiologists and chemists teamed up with engineers of the Pennsylvania State University to develop a simple and economical dairy-waste disposal process. The process is based on consumption of the proteins and milk sugars in the waste by well-aerated bacterial cells. The system is trouble-free, automatic, and self-cleaning, yet costs less than one-third as much as conventional systems. It has been installed in more than 60 dairies around the country.

FRUIT FLAVORS CAPTURED

One of the most important engineering achievements of the Eastern Division is the development of a process for recovering the volatile aroma, or flavor, of fruit juices. When a fruit juice is evaporated, most of its flavor normally escapes along with the water. The recovery process permits this flavor to be captured as a concentrated "essence," with 100 to 1000 times the flavor strength of the original juice. By this process essence can be made from the juice of apples, grapes, cherries, strawberries, blackberries, and other fruits.

These fruit essences are now used commercially in the making of jellies and can be used in the flavoring of such food products

A 4-ounce can of powdered apple juice containing natural essence makes 6 servings. (Small package of desiccant keeps powder dry until used.)

as ice cream, candy, and carbonated beverages. More important, the essence-recovery process has provided the key to the production of juice concentrates and powders with the flavor of the fresh fruit. Seven-fold superconcentrates have been made of apple, grape, and other beverage juices by removing the essence and concentrating the juice, then adding back the concentrated essence to restore the initial flavor and aroma. More recently, a method was developed by Eastern Division engineers to make dried juice powders with essence restored. These powders represent the ultimate in shipping and storage economy, and will keep for long periods at normal temperatures.

RUTIN INVESTIGATIONS

In the early days of the Eastern Division, its scientists confirmed that rutin exists in flue-cured tobacco and discovered that it was remarkably similar to that of a citrus extract whose reported physiological activity restored weakened capillaries and helped to remedy various hemorrhagic diseases. Cooperative clinical studies involving 3600 patients suffering from high blood pressure revealed that rutin restored the capillaries to normal in

Pharmaceutical preparations based on rutin are sold in every drug store.

most of those cases where they had been weakened. Additional studies have shown this drug's effectiveness in preventing hemorrhage. Eastern Division scientists later discovered a cheaper source of rutin in buckwheat. Although today's supply comes from foreign plant sources which are still more economical, the pioneering "know how" of the Eastern Division is considered to be the foundation for establishing the value of this new drug.

REVOLUTION IN MAPLE

The maple groves of Vermont, New York, Wisconsin, and and many other States are witnessing a renaissance in an industry

Modern central evaporator plant (below) contrasts with sugar house of 10 years ago.

as old as America itself. Modernization of maple-sirup processing, which has been spearheaded by scientists of the Eastern Division, has virtually revolutionized the industry.

Our scientists have taught producers sanitary methods of collecting sap that avoid quality-degrading contamination by microorganisms. New equipment and methods have streamlined the sirup-making operation and reduced it from an art to an exact science. As a result, the quality of maple sirup is improving -- 10 years ago only 50 percent was top grade as compared to 80 percent today -- and farmers are realizing more returns.

THE COTTONSEED ALLERGEN

At one time some people avoided cottonseed oil because of the fear of an allergen that had been recognized in the cottonseed. The scientists of our allergens laboratory identified the cottonseed allergen as an antigenic protein quite different from anything known heretofore. Their proof that the refining process excludes the allergen in refined cottonseed oil was a classic example of research in this field. It removed a serious obstacle to a wider utilization of margarine and other important oilseed products. This principle has since been found to apply to other vegetable oils that are refined for food and medical use.

DISCOVERING THE COMPLEXITY OF MILK CASEIN

The outstanding research done by Eastern Division scientists in the characterization of milk proteins has earned them many coveted research awards and a worldwide reputation. One of the significant findings of this research is that casein, which makes up 80 percent of the proteins in milk, is not a single com-

ponent, but a mixture of at least three substances with distinct properties. These have been characterized as alpha-, beta-, and gamma-casein, and the chemists have worked out methods for separating these components.

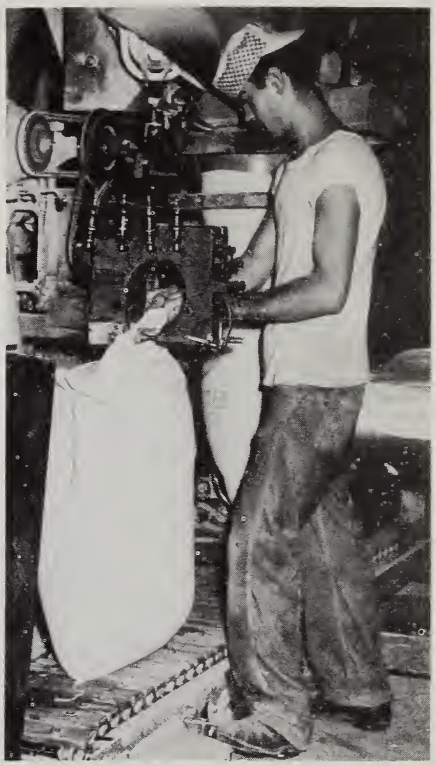
A more recent discovery of this group is that alpha-casein is not a pure casein either, but a complex consisting of one component that accounts for about 80 percent of the whole, called alpha$_1$-casein, with the remaining 20 percent divided among at least four other components. This accomplishment in basic research may well help solve a very practical problem in milk processing -- the gelling in storage of condensed and concentrated milks sterilized by high-temperature short-time methods. The separation of casein into its components helps scientists study this gelling problem by enabling them to work with just a few of the milk's components which they have well characterized instead of with such a complicated substance as whole milk. While most separated casein components are precipitated by low concentrations of calcium, one of these caseins, designated alpha$_z$-casein, is not. The characterization of this protein may play a role in stabilizing the calcium-casein complex in milk.

FATS IN FEEDS

Industrial-grade animal fats are now established as an important nutritional supplement for prepared poultry and livestock

feeds. This new outlet, developed through utilization research, is absorbing vast quantities of these fats.

Most of today's feeds need fat supplementation because the natural oils in the meals, which are the basic feed ingredients, are almost completely removed by modern extraction processes. Industrial-grade fats, which are perfectly suitable for animal feeding and are cheaper than these oils, can be used to replace them with an economic advantage.



Fats reduce the dustiness of animal feeds as well as enhancing their nutritional value. This feed-plant employee can safely bag fat-containing feed without a dust mask. The virtual absence of dust also eliminates a serious explosion hazard.

To determine the most efficient use of fats by the feed industry, Eastern Division scientists, in collaboration with scientists of the American Meat Institute, established by feeding tests the grades of fat that should be used, the fat level for a wholesome diet, and the best processes for incorporating fats into feeds.

Almost as soon as the results of this research were announced, in 1953, feeds began to be supplemented with animal fats. Since then, more and more feed manufacturers have adopted

the practice until now about a half billion pounds of fat are used annually in feeds. The mixing of fats with feeds has additional advantages: it markedly reduces the annoying and dangerous dustiness usually associated with feed-mill operations, and improves the color of the finished product.

PUBLICATIONS AND PATENTS

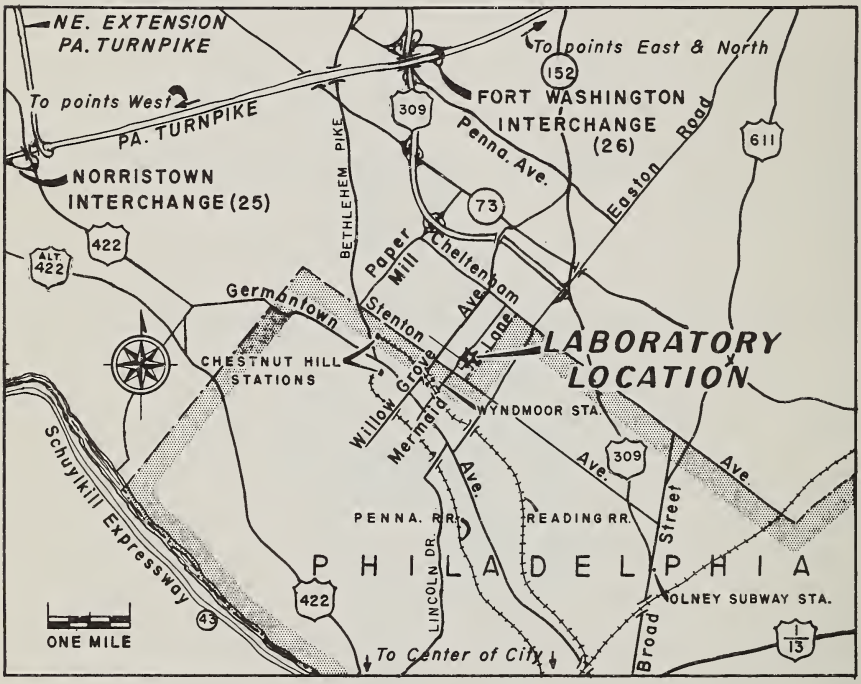
Since 1940, Eastern Division scientists have prepared over 1300 publications, and their developments are covered by some 300 patents. The publications are mostly technical articles in scientific journals and books, but they include a number of USDA Bulletins and Handbooks and some semipopular reviews of the work in progress.

The patents are awarded for inventions resulting from the work, and are assigned by the inventor to the Secretary of Agriculture. Any individual or organization in the United States can obtain cost-free licenses to use these patented inventions. Patents recently issued cover such diverse subjects as polymers, stabilizers, and detergents from animal fats; improved maple products; milk products, such as dry milk and a rapid process for making potato flakes; and use of plant sapogenins as intermediates in the manufacture of steroidal hormones.

A list of the publications and patents of the Eastern Division, issued semiannually, is available on request.

VISITORS WELCOME

Visitors are always welcome, and conferences may be arranged with staff members to discuss their research work. Groups will be given conducted tours. Arrangements for visits should be made with the Director or members of the staff listed on page 2. Children over 12 may be included in the tours. All laboratories are open daily except Saturdays, Sundays, and holidays.



LOCATION AND TRANSPORTATION

Eastern Utilization Research and Development Division

600 E. Mermaid Lane

Philadelphia 18, Pa.

Open 8:30 a.m. to 5:00 p.m. Telephone CHestnut Hill 7-5800

HOW TO REACH THE WYNDMOOR LABORATORIES:

By car. The point most accessible to the Wyndmoor Laboratories and most easily found from virtually any distant location is the Fort Washington Interchange of the Pennsylvania Turnpike. From here follow US 309 south to Paper Mill Road (2.5 mi.). Turn right on Paper Mill Road to Cheltenham Avenue (0.3 mi.). Turn left at Cheltenham Avenue and go to Mermaid Lane (1.2 mi.), and turn right to the Laboratories (0.9 mi.). From the center of Philadelphia, go north on Broad Street to Stenton Avenue (6200 north), turn left, follow Stenton Avenue to Mermaid Lane (3.4 mi.), turn right, and go two blocks to the Laboratories.

By Pennsylvania Railroad. Take Chestnut Hill train from Philadelphia at Suburban Station, 16th Street and Pennsylvania Boulevard; at 30th Street Station; or at North Philadelphia Station. Laboratories are 1-1/2 miles from Chestnut Hill station. Take a taxi, or a southbound "L" bus marked "Broad-Olney Subway" to Mermaid Lane and walk 2 blocks east to the Laboratories.

By Reading Railroad. Take Chestnut Hill train from Philadelphia at Reading Terminal, 12th and Market Streets; at North Broad Street Station; or at Wayne Junction. Get off at Wyndmoor. The Laboratories are 5 blocks east of station on Mermaid Lane.

By Local Transportation. Take a northbound Broad Street Subway train to Olney Avenue. Get transfer when paying fare. Transfer to "L" bus marked "Erdenheim" at northwest corner of Broad Street and Olney Avenue. Get off bus at Mermaid Lane and Stenton Avenue, and walk 2 blocks east to the Laboratories.

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U.S. Department of Agriculture South Building
14th St. & Independence Ave., S.W.
Washington, D.C.

Open 9:00 a.m. to 5:30 p.m. Telephone REpublic 7-4142

Dairy Products Laboratory - Room 1655
Allergens Pioneering Research Laboratory - Room 0125

* * * * *

Beltsville Laboratories
Agricultural Research Center
Beltsville, Md.

Open 8:00 a.m. to 4:30 p.m. Telephone TOwer 9-6430

Meat Laboratory - Animal Husbandry, Main Building
Cheese Investigations - Dairy Products Building

HOW TO REACH THE BELTSVILLE LABORATORIES:

The Agricultural Research Center, at which the two Beltsville Laboratories are located, lies between US 1 and the Baltimore-Washington Parkway, about 15 miles northeast of Washington, D.C. The laboratories are conveniently reached only by automobile. The Beltsville stop of the Greyhound and National Trailways buses, which run on US 1 between Washington and Baltimore, is about 2 miles from the Laboratories.

GENERAL INFORMATION ABOUT THE UTILIZATION RESEARCH AND DEVELOPMENT DIVISIONS

Division	*Director of Division*	*Mailing Address*	*Division Area**	*Fields of Research*
Eastern	P.A. Wells	600 E. Mermaid Lane Philadelphia 18, Pa.	Conn., Del., Ky., Maine, Md., Mass., N.H., N.J., N.Y., Pa., R.I., Vt., Va., W. Va.	Animal products: dairy, meat, fats, and leather; plant products: Eastern fruits and vegetables, tobacco, honey, maple, and new crops; allergen studies.
Northern	F.R. Senti	1815 N. University St. Peoria 5, Ill.	Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Nebr., N.Dak., Ohio, S. Dak., Wis.	Cereal grains: corn, wheat, barley, grain sorghum, and oats; oilseeds: soybean, flaxseed, safflower, and erucic acid-containing oilseeds; new crops.
Southern	C.H. Fisher	1100 Robert E. Lee Blvd. New Orleans 18, La.	Ala., Ark., Fla., Ga., La., Miss., N.C., Okla., S.C., Tenn., Texas.	Cotton and cottonseed; tung fruit; pine gum; Southern fruits and vegetables, including citrus, sweetpotatoes, and cucumbers; sugarcane; rice; peanuts; new crops.
Western	M.J. Copley	800 Buchanan St. Albany 10, Calif.	Ariz., Calif., Colo., Idaho, Mont., Nev., N. Mex., Oreg., Utah, Wash., Wyo., Hawaii, Alaska.	Western fruits, nuts, vegetables, and rice; poultry products; forage crops; wheat; barley; wool and mohair; sugar beets; dry beans and peas; castor beans; new crops.

*States listed are those primarily served by the particular Division, although the research programs of each Division are of national scope and interest.

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